

DRAWINGS ATTACHED

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(19)



(54) METHOD OF IMPROVING THE KEEPING PROPERTIES OF ALCOHOLIC
 BEVERAGES PRODUCED BY FERMENTATION

- (71) We, MESSER GRIESHEIM G.m.b.H.,
 a Company organised under the laws of
 Germany, of Frankfurt/Main, Hanauer
 Landstr. 300, Germany, do hereby declare
 the invention, for which we pray that a
 patent may be granted to us, and the
 method by which it is to be performed, to
 be particularly described in and by the
 following statement:—
- The invention relates to the improvement
 of the keeping properties of beverages, par-
 ticularly although not exclusively beers, by
 the use of inert gases in the production,
 bottling, and storage of these beverages.
- Owing to longer storage times and time
 taken during exportation, increasingly high
 demands have recently been made in respect
 of keeping properties of beverages. In the
 presence of oxygen, usually atmospheric oxy-
 gen, material changes occur in the beverages
 which greatly impair their technological and
 taste properties.
- It is therefore important to prevent access
 of oxygen to the beverages, as far as pos-
 sible. Manufacture of the beverages, in-
 cluding after-fermentation, decanting, stor-
 age, and bottling should therefore take place
 in an inert gas atmosphere, with the exclu-
 sion of oxygen. The empty space remaining
 in storage vessels after filling with a bever-
 age should also be filled with inert gas.
- Carbon dioxide (CO₂) was hitherto mainly
 used as inert gas for this purpose. Carbon
 dioxide is produced, among other ways, by
 alcoholic fermentation. The amounts of
 carbon dioxide produced are sufficient to
 meet the internal requirements of breweries,
 but it is, however, difficult for the carbon
 dioxide needed for later operations, such
 as for example bottling, to be produced
 with the necessary purity from the fermenta-
 tion products. In addition, this process en-
 tails considerable capital expense for closed
 fermentation vats, piping, compressors, stor-
 age and pressure vessels, etc. For this reason,
 part of the carbon dioxide is purchased from
 gas supplies.
- Carbon dioxide is dissolved in the finished
 beer (in larger or smaller amounts depend-
 ing on the pressure). If the pressure were to
 be lowered, some of the carbon dioxide dis-
 solved would be liberated. All decantation
 and filling operations must therefore be
 carried out at a higher pressure than the
 pressure of saturation.
- In order to maintain required pressure in
 the tanks or selling vessels, an inert gas
 should be used in all cases, in order to avoid
 oxidation.
- The present invention is based on the ob-
 servation that nitrogen or argon or other
 inert gases in Group O of the Periodic
 Table are particularly suitable for this pur-
 pose.
- The present invention therefore provides
 a method of improving the keeping proper-
 ties of alcohol beverages produced by fer-
 mentation, which comprises effecting the
 main fermentation, and then carrying out
 after-fermentation of the alcoholic bever-
 ages and any after-treatment (as hereinbefore
 defined) in an atmosphere of an inert gas
 selected from: nitrogen and the rare gases
 of group O of the Periodic Table.
- By "after-treatment" of the beverages is
 meant decanting, and if desired, bottling and
 storing the beverages, in an inert gas atmo-
 sphere, after the fermentation. Nitrogen is
 preferably used as inert gas, but rare gases
 such as argon and the other inert gases in
 Group O of the Periodic Table are also
 used.
- The use of nitrogen is above all, very
 economical.
- In order to avoid loss of carbon dioxide,
 the conditions of equilibrium adjusted dur-
 ing the after-fermentation of the alcohol
 beverages should not be changed. This means
 that during filtering, decanting or bottling
 and during storage of the beverages a mini-
 mum pressure must always be applied to the
 liquid. Thus, for example, the pressure tanks
 and, in the case of fully automatic filling
 machines, the cleaned empty bottles, should

preferably first be pre-pressurised with gas. It has now been found particularly advantageous that this pre-pressurising should be effected with an inert gas, for example nitrogen. If the bottles are, in addition, evacuated before the pre-pressurising, particularly favourable results are obtained since the oxygen, which is detrimental to storage, is then almost completely removed. The beverages can then be kept for a particularly long period of time.

In order to illustrate clearly the process of the invention, various series of tests were carried out with beer as alcoholic beverage. The suitability of the process was clearly provide by cold stability measurements, shaking tests, and oxygen content measurements.

In the first series of tests, the bottling of beer by means of an automatic bottling machine was carried out under various conditions. The conditions used in the various series of tests were as follows:

1. First series of tests: Storage or pressure tanks were pre-pressurised with nitrogen, filled with beer under pressure, and the beer was subsequently forced and emptied under pressure, with the aid of nitrogen, to the bottling machines. The bottles were pre-pressurised, likewise with nitrogen, after pre-evacuation to the extent of 98% of their volume (i.e. the bottles are evacuated to 2% of their original air content).

2. Second series of tests: Pre-pressurisation of the tank was carried out as in the first series of tests. The pre-pressurisation of the bottles was effected with nitrogen, but without pre-evacuation.

3. Third series of tests: The tanks were filled with beer under pressure without pre-pressurisation of the tanks with inert gas, and subsequently the beer was forced, by means of nitrogen, to the bottling machine. Before filling, the bottles were evacuated and pre-pressurised with nitrogen.

4. Fourth series of tests: Normally pre-treated beer was bottled with the aid of compressed air.

Nitrogen was supplied from a storage vessel containing liquid nitrogen. The latter was stored in a cold gasifier and transported to the consumption points via a pressure regulator, automatically adjusting a gauge pressure of 5 atmospheres nitrogen.

After bottling in accordance with the conditions indicated, the beer was subjected to a cold stabilisation test and a shaking test.

In the test for cold stability, the beer was in each case kept alternately for 24 hours at +24°C and 24 hours at 0°C and turbidity

was measured. A cycle of 48 hours is referred to as a 'heat day'.

In the shaking test, the beer was shaken in a storage cellar at -1°C, and the shaking time before the occurrence of turbidity was measured. The degree of turbidity is measured in EBC units in a haze meter (European Brewery Convention). The scale extends from 0 to 12, and turbidity rises with increasing EBC value. The measurements are shown in the Tables in Figures 1 and 2.

The table values clearly show that the best keeping properties of the beer were obtained by using the process of the first series of tests, that is to say, when carrying out the method according to the invention. The poorest keeping properties occurred with the process of the fourth series of tests, which is the usual process employed at present in the art. The oxygen content of a bottle from the first series of tests amounted to 0.1 mg, and that of a bottle from the fourth series of tests to 0.4 mg.

The supply of nitrogen for the process of the invention may be obtained from ordinary commercially available cold gasifiers, which can be refilled after use. The nitrogen is converted from the liquid state to the gaseous state by means of air-heated evaporators. Using ordinary pressure regulators, it is possible for inert gas pressures of up to 20 atmospheres gauge to be adjusted automatically.

WHAT WE CLAIM IS:—

1. A method of improving the keeping properties of alcoholic beverages produced by fermentation, which comprises effecting the main fermentation, and then carrying out after-fermentation of the alcoholic beverages and any after-treatment (as hereinbefore defined) in an atmosphere of an inert gas selected from: nitrogen and the rare gases of group O of the Periodic Table.

2. A method as claimed in claim 1, wherein the rare gas used is argon.

3. A method as claimed in claim 1 or 2, wherein the alcoholic beverage is a beer.

4. A method as claimed in any one of claims 1 to 3, wherein during the after-fermentation, decanting, filling into containers and also during storage, the alcoholic beverages are subjected to a superatmospheric pressure by the inert gas.

5. A method as claimed in any one of claims 1, 3 or 4, wherein nitrogen is used as inert gas and is supplied from a storage vessel for liquid nitrogen by way of a gasifier and a pressure regulator to the beverage containers, or to the piping system of a bottling plant where the beverage is bottled.

6. A method as claimed in claim 1, and

substantially as described herein with reference to the accompanying drawings.

7. Alcoholic beverages produced by fermentation and having improved keeping
5 properties, whenever treated by the method claimed in any one of claims 1 to 6.

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Fig. 1

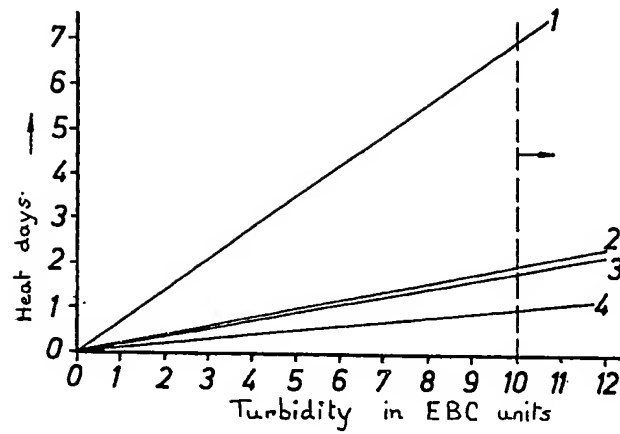
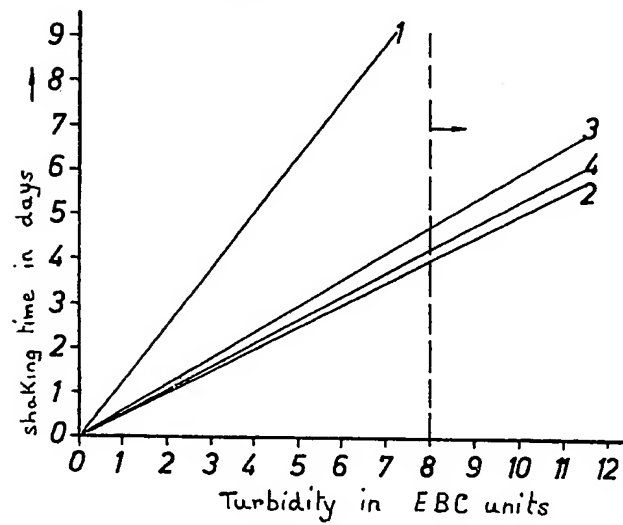


Fig. 2



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